

## Effective science and math instruction

In 2003 Horizon Research, Inc. (HRI) observed 364 mathematics and science lessons nationwide to provide a snapshot of what transpires inside classrooms and to identify factors that shape instruction.

Effective lessons were distinguished by their ability to: (1) Engage students with the mathematics/science content; (2) Create an environment conducive to learning; (3) Ensure access for all students; (4) Use questioning strategies to monitor and promote understanding; and (5) Help students make sense of the mathematics/science content. While most lessons were strong in incorporating significant and accurate content, few lessons were intellectually rigorous, included questioning that was likely to enhance conceptual understanding, or provided student opportunities to make sense of new concepts.

Extended interviews were conducted to determine the factors that had the greatest influence on the design and implementation of the lessons. The most frequently cited influences on lesson content were

state curriculum standards, followed by the textbook, then state accountability systems. In contrast, teachers voiced much greater autonomy in choosing instructional strategies. The factors that most influenced their pedagogy included their own background knowledge and beliefs, followed by textbooks, and the perceived ability of their students.

The report leaves administrators with several key questions to consider:

- How are we providing teachers opportunities to analyze lessons in relation to the elements of effective instruction and reflect on their knowledge and beliefs about teaching and learning?
- What are we doing to ensure that instructional materials provide support to teachers in identifying learning goals, describing research on student learning, and suggesting questions that can monitor and promote student understanding?
- Do our district-supported professional development programs model the elements of effective instruction?

### WASL Ready?

**Only 15 percent of mathematics and science lessons observed nationwide were considered high quality**

- Weiss, et al, 2003.

### Port Townsend School District

A significant portion of the science WASL focuses on students' ability to design scientific investigations. The secondary teachers on the Port Townsend Science Leadership team recognized that for students to succeed on the WASL they needed to articulate the experimental design and lab report protocols required of students across grade levels. They carefully examined materials used with grade 6-12 students and identified differences in the scientific process and vocabulary used in those materials and on the WASL. They also identified subtle variation in how students were asked to design and report on their investigations as they moved from one grade to the next.

Working as a vertically articulated team, the teachers developed common instructional practices for both vocabulary development and laboratory reports that were coherent across grade levels with increasing sophistication based on what was developmentally appropriate for students.

#### Questions to Consider

- ❖ How do teachers in your district engage students in designing and reporting on scientific investigations?
- ❖ How do you implement consistent, developmentally-appropriate science learning experiences across grade levels?
- ❖ How can your NCOSP District Action Plan help you support collaboration among teachers at different grade levels?

### Bellingham School District

Curriculum Topic Study (CTS) builds a bridge between science standards, research on students' ideas in science, and opportunities for students to learn through improved teacher practice. At Carl Cozier Elementary, first grade teacher Caren Pitsch has gathered together a group of her colleagues to reflect on their knowledge and beliefs about teaching and learning and improve their instruction by engaging in the CTS process.

One afternoon each week these teachers meet to delve deeply into the Science CTS Guide. Supported by the GLEs, the CTS process helps these teachers analyze and fine tune their understanding of big ideas in science, focus their instruction on important learning targets, and recognize misconceptions their students may hold as prior knowledge. The teachers believe this collaborative work is improving their content knowledge, enhancing their questioning skills, and increasing student understanding in science so they can succeed on the WASL.

#### Questions to Consider

- ❖ How could the February LCF on Curriculum Topic Study help you and your teachers improve science instruction?
- ❖ How are your teachers identifying their students' misconceptions about science?
- ❖ How are you engaged in talking with teachers about effective science instruction?



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## Calendar of upcoming events

- Feb 6 Science Notebooks Training, Mount Vernon, 4:00 – 7:00 (ESD189)
- Feb 7 Initial Use Trainings: STC Magnets and Motors; STC Plant Growth and Development, Ferndale, 8:30-3:30 (ESD189)
- Feb 9 STC-MS Catastrophic Events Initial Use Training, Sequim, 8:00 – 3:00 (ESD114)
- Feb 22-3 Developing FOSS Initial Use Trainers, Bremerton, 9:00-4:00 (ESD114, NCOSP)
- Feb 27-8 NCOSP Learning Community Forum, Cotton Tree Inn, "Leading and Learning with Curriculum Topic Study" (NCOSP)
- Mar 7 Developing FOSS Initial Use Trainers, Mount Vernon, 9:00-4:00 (ESD189, NCOSP)
- Mar 9 Science Content Training, Mount Vernon, 8:30-3:30 (ESD189)
- Mar 16 NCOSP Learning Community Forum, Bremerton, "Looking for Evidence of Student Learning" 9:00 – 3:30 (NCOSP)
- Mar 23 NCOSP Learning Community Forum, Mount Vernon, "Looking for Evidence of Student Learning" 9:00 – 3:30 (NCOSP)
- Mar 27 Teacher Leader-Administrator Symposium, Location TBD, "Effective Science Instruction" (NCOSP)
- Mar 30 LASER Strategic Planning Institute applications due (LASER)

## Key references and resources

Fouts, J.T. (2003). "A decade of reform: A summary of research findings on classroom, school, and district effectiveness in Washington State." Available at: <http://www.spu.edu/wsrc/currentresearch.html>

"Project 2061 Evaluation of Science and Mathematics Textbooks". Available at: <http://www.project2061.org/publications/textbook/default.htm>

Weiss, I.R., Pasley, J.D., Smith P.S., Banilower, E.R. Heck, D.J. (2003). "Looking inside the classroom: A study of K-12 mathematics and science education in the United States". Available at: <http://www.horizon-research.com/insidetheclassroom/reports/looking/>